6.56. **Model:** We will model the container as a particle of mass \( m \). The steel cable of the crane will be assumed to have zero mass.

**Visualize:**

<table>
<thead>
<tr>
<th>Known</th>
</tr>
</thead>
<tbody>
<tr>
<td>( m = 4500 \text{ kg} )</td>
</tr>
<tr>
<td>( T_{\text{max}} = 50,000 \text{ N} )</td>
</tr>
<tr>
<td>( v_{\text{max}} = 3.0 \text{ m/s} )</td>
</tr>
<tr>
<td>( a_{\text{max}} = 1.0 \text{ m/s}^2 )</td>
</tr>
</tbody>
</table>

**Pictorial representation**

- **Solve:** As long as the container is stationary or it is moving with a constant speed (zero acceleration), the net force on the container is zero. In these cases, the tension in the cable is equal to the gravitational force on the container:

\[
T = mg = 44,000 \text{ N}
\]

The cable should safely lift the load. More tension is required to accelerate the load. Newton’s second law is

\[
(F_{\text{net}})_y = \Sigma F_y = (F_G)_y + (T)_y = -mg + T = ma_y
\]

The crane’s maximum acceleration is \( a_{\text{max}} = 1.0 \text{ m/s}^2 \). So the maximum cable tension is

\[
T_{\text{max}} = mg + ma_{\text{max}} = 48,600 \text{ N}
\]

This is less than the cable’s rating, so the cable must have been defective.